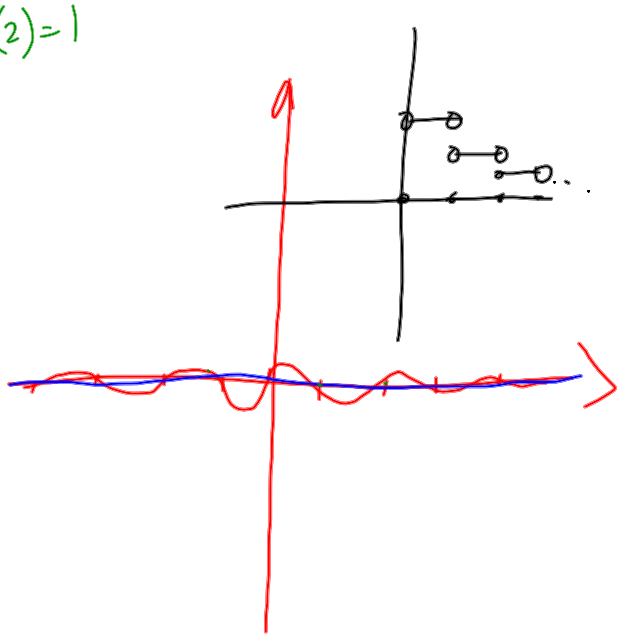
AP Calculus - 2012-09-05

$f(0) = f(2) = 1$

17) $f(x) = \begin{cases} 0, & x \text{ is an integer} \\ \text{not } 0, & x \text{ is not an integer} \end{cases}$

$\lim_{x \to \infty} f(x) = \lim_{x \to -\infty} f(x) = 0$

$f(x) \neq 0$ if x is not an integer



Sep 5-7:21 AM

2.1/31 Suppose that $f(x)$ is a f^n such that

$$\lim_{t\to 0^+} f\left(\frac{1}{t}\right) = L \qquad \lim_{t\to 0} f\left(\frac{1}{t}\right) = L$$

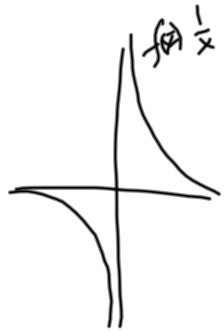
what do you know about $\lim_{x\to\infty} f(x)$? . .

change of variable

Let $x = \frac{1}{t}$. $\quad t = \frac{1}{x}$

$$\lim_{\boxed{x\to+\infty}} f(x) = L$$

then what is $\lim_{t\to 0}\left(x = \frac{1}{t}\right) = DNE$



$$\lim_{t\to 0^+} \overset{x=}{\frac{1}{t}} = +\infty \qquad \lim_{t\to 0^-} \frac{1}{t} = -\infty$$

3) $\lim_{x\to a} f(x) = 2$ $\lim_{x\to a} g(x) = -4$ $\lim_{x\to a} h(x) = 0$

$\lim_{x\to a} (2) = 2$

3f) $$\lim_{x\to a} \frac{2}{g(x)} = \frac{2}{\lim_{x\to a} g(x)} = \frac{2}{-4} = -\frac{1}{2}$$

3g) $$\lim_{x\to a} \frac{3f(x) - 8g(x)}{h(x)} = \frac{3\left(\lim_{x\to a} f(x)\right) - 8\left(\lim_{x\to a} g(x)\right)}{\lim_{x\to a} h(x)}$$

$$= \frac{3(2) - 8(-4)}{\text{uh-oh.}}$$

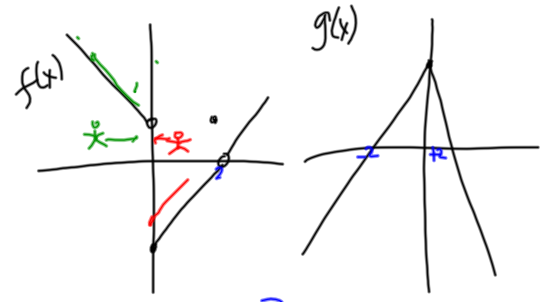
$$\frac{6+32}{\lim_{x\to a^+} h(x)}$$

dne

$+\infty$

$-\infty$

4)



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mostly for piecewise fns and for SETS

4a) $\lim_{x\to 2}[f(x)+g(x)]$

$= \lim_{x\to 2} f(x) + \lim_{x\to 2} g(x) = 0 + 0$

$= 0$

4b) $\lim_{x\to 0}[f(x)+g(x)]$

$= \lim_{x\to 0} f(x) + \lim_{x\to 0} g(x) = \left(\lim_{x\to 0} f(x)\right) + 2$

dne

$= DNE$

$\lim_{x\to 0^+} f(x) = -2$

$\lim_{x\to 0^-} f(x) = 1$

4g) $\lim_{x\to 0^+} \sqrt{f(x)} = \sqrt{\lim_{x\to 0^+} f(x)}$

$= \sqrt{-2}$ DNE

22/7

$$\lim_{x\to 4} \frac{x^2-16}{x-4} = \lim_{x\to 4} \frac{(x-4)(x+4)}{(x-4)}$$

1) try substitution $\frac{4^2-16}{4-4} = \frac{0}{0}$

$$= \lim_{x\to 4} (x+4) = 8$$

BE CAREFUL ⟹ Strategy

"indeterminate form"

try to "cancel" the zeros

13) $$\lim_{t\to 2} \frac{t^3+3t^2-12t+4}{t(t-2)(t+2)} = \lim_{x\to 2} \frac{(x-2)(x^2+5x-2)}{(x-2)(x)(x+2)}$$

1) try substitution "$\frac{0}{0}$"

$$(2)^3+3(2)^2-12(2)+4 = 8+12-24+4=0$$

$P(2)=0$

$(x-2)$ is a factor

$$\frac{x^3}{x}=x^2 \qquad \frac{5x^2}{x}=5x$$

$$\begin{array}{r} x^2+5x-2 \\ (x-2)\overline{)\,x^3+3x^2-12x+4} \\ -(x^3-2x^2) \\ \hline 5x^2-12x+4 \\ -(5x^2-10x) \\ \hline -2x+4 \\ (-2x+4) \\ \hline 0 \end{array}$$

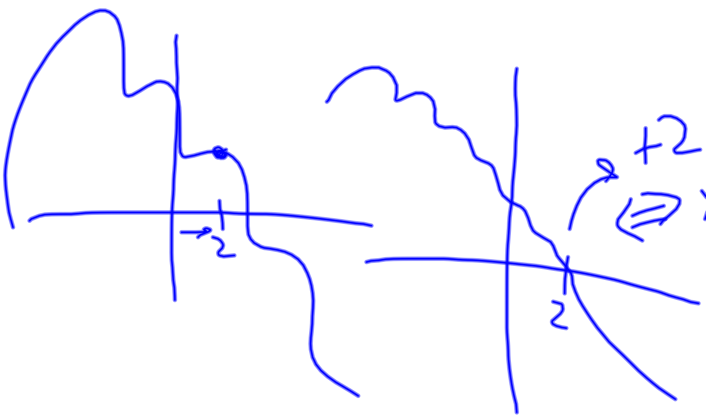
$$\begin{array}{r|rrrr} +2 & 1 & 3 & -12 & 4 \\ & \downarrow & 2 & 10 & -4 \\ \hline & 1 & 5 & -2 & \boxed{0} \end{array}$$

remaind.

$P(x)=(x-a)(x-b)(x-c)\cdot(x^2+f_1x+f_2)\cdot(c)$

not reducible

if $P(2)=0$ then



$+2$ a root $\Leftrightarrow$ $x-2$ is a factor